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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/911,069	07/23/2001	Charles H. Perry	FIS920000062US2	6945
7590		02/27/2004	EXAMINER	
Cantor Colburn LLP		GOFF II, JOHN L		
55 Griffin Road South		ART UNIT		
Bloomfield, CT 06002		PAPER NUMBER		
		1733		

DATE MAILED: 02/27/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

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<b>Office Action Summary</b>	<b>Application No.</b> 09/911,069	<b>Applicant(s)</b> PERRY ET AL.	
	<b>Examiner</b> John L. Goff	<b>Art Unit</b> 1733	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

#### Status

- 1) ☒ Responsive to communication(s) filed on 31 December 2003.
- 2a) ☐ This action is **FINAL**.                      2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

#### Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

#### Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

#### Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All    b) ☐ Some \*    c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

#### Attachment(s)

- |  |   |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892)  | 4) <input type="checkbox"/> Interview Summary (PTO-413)<br>Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948)                                   | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152)             |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)<br>Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____  |

## **DETAILED ACTION**

### ***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 12/31/03 has been entered. The previous rejection under 35 U.S.C. 112 has been overcome.
2. The text of those sections of Title 35, U.S. Code not included in this action can be found in a prior Office action.

### ***Claim Rejections - 35 USC § 102***

3. Claims 1, 9, and 12 are rejected under 35 U.S.C. 102(b) as being anticipated by IBM (IBM Technical Disclosure Bulletin – “Solder Plated Resin Ball”).

IBM discloses a preformed interconnection for joining two electrical devices, e.g. between the pad of a semiconductor chip and a pad of a substrate. IBM teaches the interconnection comprises an adhesive and barrier material such as nickel, i.e. a conductive polymer composition comprising a polymer component and an electrically conductive component, coated with solder. IBM teaches bonding together two electrical devices through the interconnection by soldering first, i.e. first cap, and second, i.e. second cap, portions of the interconnection (e.g. in the shape of a ball) to pads of each device (See the technical bulletin).

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4. Claims 11 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Higashiguchi (U.S. Patent 5,883,432).

Higashiguchi is directed to forming an electrical interconnection between two devices, a semiconductor device and a printed circuit board. Higashiguchi teaches bonding (soldering) metal bumps/platings (solderable caps) onto a printed circuit pattern (contact pad) on the printed circuit board and onto an electrode pad on the semiconductor device, applying an electrically conductive adhesive comprising a polymer component and conductive particles onto the metal bumps/platings, and thermocompressing the printed circuit board to the semiconductor device to cure the adhesive and form an electrical interconnection (Figures 1A and 2 and Column 3, lines 1-3 and 5-9 and Column 4, lines 5-12). Higashiguchi teaches the conductive particles comprise gold, silver, nickel, etc. (Column 3, lines 62-67 and Column 4, lines 1-2). Higashiguchi teaches the metal bumps/platings comprise gold, solder, etc. (Column 3, lines 29-30). Higashiguchi teaches embodiments wherein the solderable caps are disposed in substantially planar contact with the conductive polymer composition (Figure 10 and Column 6, lines 44-51 and Column 7, lines 11-16 and 46-61).

***Claim Rejections - 35 USC § 103***

5. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later

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invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

6. Claims 1-10 and 12-19 are rejected under 35 U.S.C. 103(a) as being unpatentable over IBM in view of Kang et al. (U.S. Patent 6,337,522) and any one of Vardaman ("Worldwide Trends in Flip Chip Developments"), Glenn (U.S. Patent 6,441,485), or Hiwada (JP 09323415 with U.S. Patent 6,270,193 used as a translation).

IBM is described above in paragraph 3. As noted above, IBM teaches the interconnection comprises a conductive polymer composition. IBM teaches the conductive polymer composition is formed of a resin ball coated with a conductor. IBM is silent as to using as the conductive polymer composition one that is formed of a resin ball comprising conductive particles. However, it would have been well within the purview of one of ordinary skill in the art at the time the invention was made to use as the conductive polymer composition taught by IBM one that is formed of either a resin ball coated with a conductor or a resin ball comprising conductive particles as both were well known and conventional functional equivalents in the art for providing a conductive polymer composition as shown for example by any one of Vardaman, Glenn, or Hiwada such that only the expected results would be achieved.

Regarding claims 2, 3, 13, and 14, IBM is silent as to any specific polymer component used in the conductive polymer composition such that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use any of the well known and conventional polymer components used in the art of conductive adhesives such as polyimides, siloxanes, etc. known as shown for example by Kang et al. as only the expected results would be achieved.

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Regarding claims 4 and 15, IBM is silent as to all particular materials useful as the conductive component in the conductive polymer composition, and IBM is not limited to any particular conductive materials such that it would have been obvious to one of ordinary skill in the art at the time the invention was made to use any of the well known and conventional conductive materials used in the art of conductive adhesives such as gold, silver, etc. known as shown for example by Kang et al. as only the expected results would be achieved.

Regarding claims 5 and 16, one of ordinary skill in the art at the time the invention was made would have readily recognized that solder is a low-melting temperature alloy formed of materials such as those claimed and in particular tin and lead.

Regarding claims 6, 7, 17, and 18, IBM is silent as to a specific teaching on the size of the interconnection. However, it would have been obvious to one of ordinary skill in the art at the time the invention was made to determine the optimal size of the interconnection as a function of the interconnection strength or type of product produced as doing so would require nothing more than ordinary skill and routine experimentation.

Regarding claims 8 and 19, IBM is silent as to the specific resistivity of the polymer component of the conductive polymer composition. However, absent any unexpected results it would have been obvious to one of ordinary skill in the art at the time the invention was made to use a conductive polymer composition having a low resistivity to improve the electrical contact between the two devices.

Vardaman, Glenn, and Hiwada disclose known methods for bonding two substrates in flip chip manufacture using a conductive polymer composition wherein the conductive polymer composition is provided in a number of different, functionally equivalent forms including a resin

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ball coated with a conductor or a resin ball comprising conductive particles (See Table 1 of Vardaman and Column 3, lines 9-21 of Glenn and Column 13, lines 7-15 of Hiwada). Kang et al. are directed to forming an electrical interconnection between two devices. Kang et al. teach applying a solder ball to the contact pad of a first device, applying an electrically conductive adhesive to the contact pad of a second device, and thermocompressing the two devices together by joining the solder ball and the electrically conductive adhesive (Figure 4 and Column 6, lines 15-19 and 25-42). Kang et al. teach the electrically conductive adhesive comprises a polymer component and a conductive component. Kang et al. teach the polymer component comprises polyimides, siloxanes, etc. (Column 5, lines 37-42). Kang et al. teach the conductive component comprises conducting particles such as gold, silver, etc. (Column 5, lines 43-44).

### ***Response to Arguments***

7. Applicant's arguments with respect to claims 1-20 have been considered but are moot in view of the new ground(s) of rejection.

Applicant argues "More specifically, in a telephone interview conducted on December 16, 2003, between the undersigned and Examiners John L. Goff and Jeff Aftergut, it was advanced by the Applicants that even if one skilled in the art were motivated to combine the Higashiguchi and IBM TDB references, the resin balls encapsulated with solder shown in the IBM TDB would be used in lieu of bumps 4 and 6 of Higashiguchi. That being the case, there would be no need for the electrically conductive resin adhesive 10, 11 shown in Figure 2, since the conductive solder completely encapsulates the resin ball. Therefore, the claimed structure

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would not result from any suggested combinations of the two references.” This argument is addressed above in the new rejections.

Applicant further argues, “In addition, independent claim 20 has been added to more particularly point out that the first (and second) solderable cap is disposed in substantially planar contact with the conductive polymer composition. Support for the amendment is found at least in Figures 2, and Figures 5a-5c, as well as page 8, lines 18-19 and page 9, line 8 through page 11, line 3 of the specification. During the above referenced telephone interview, it was also pointed out that the solder material 3 disclosed by the IBM TDB reference completely encapsulates the resin ball 1 and barrier material 2. Accordingly, as reflected in the Interview Summary dated December 17, 2003, the IBM TDB does not teach or disclose substantially planar (i.e., non-continuous) caps.” The examiner agrees IBM TDB does not teach or disclose substantially planar (i.e., non-continuous) caps. However, new claim 20 does not require a “completed” interconnection (as required by claim 1 discussed in the interview) and as such Higashiguchi anticipates the claim. Incorporating the above limitation in the following manner into claim 20 would make the claim allowable:

20. A method of forming an electrical connection between two devices, comprising:

bonding a completed interconnection on a first contact pad of a first component,  
wherein said completed interconnection comprises

a conductive polymer composition comprising a polymer component and an  
electrically conductive component; and,

a first solderable cap disposed in substantially planar contact with said conductive  
polymer composition; and,



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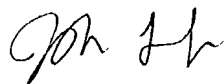
soldering said first solderable cap to a second contact pad of a second component.

### ***Conclusion***

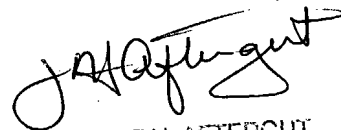
8. Any inquiry concerning this communication or earlier communications from the examiner should be directed to **John L. Goff** whose telephone number is **(571) 272-1216**. The examiner can normally be reached on M-F (7:15 AM - 3:45 PM).

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Richard Crispino can be reached on (571) 272-1226. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).



John L. Goff  
February 19, 2004



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